

USSN: 10/723,321

Docket No. 56770US035

Remarks

Claims 10, 11, 14, 15 and 20 have been amended as shown above. Support for the amendments may be found in the written description at, e.g., page 2, lines 17-19, page 3, line 19 through page 4, line 27, page 11, line 1 through page 12, line 11, page 15, line 12 through page 16, line 2, page 21, lines 23-28 and page 22, line 20 through page 23, line 3. Following entry of this amendment, claims 1-21 will remain pending in the application.

Applicants thank the Examiner for extending to the undersigned attorney the courtesy of an in-person interview on Wednesday, August 16, 2006. The substance of the interview was correctly recorded in the Interview Summary prepared by the Examiner at the conclusion of the interview. The interview also involved the arguments shown below.

Rejection of Claims 10-19 and 21 Under 35 U.S.C. §103(a)

Claims 10-19 and 21 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Nos. 4,842,893 (Yializis et al. '893) or 5,032,461 (Shaw et al. '461) in view of EP 0 475 441 A2 (Komiya EP), and optionally further considering the article by Dr. Shaw entitled "A New High-Speed Vapor Deposition Process for Applying Acrylate Coatings" (paper presented 4/30/1992), on grounds *inter alia* that:

"To reiterate, the primary references teach flash evaporating and curing monomers of acrylates to form uniform thin on substrates films that may be flexible plastics, like polyesters, which are thermoplastics, and where the coatings may be used for packaging materials. An inorganic or metal layer may be vacuum (evaporation or sputter) deposited thereon, followed by another vapor deposited acrylate monomer layer, which is cross-linked. Additional interleaved layers may also be deposited. Continuous substrates and rotating drum supports are illustrated and discussed. In Yializis et al. ('893), see the abstract; Figures 1-3, 4d & 5; col. 1, lines 12-22, 23-25+ & 43-48 (for food packaging, related to making capacitors, or protective coatings for metals or other materials, etc); col. 2, lines 28-50+; col. 3, lines line 8 (flush evaporated), 20-25 (curing), and 26-65 (substrates, e.g. polyester or polyolefins, flexible, like packaging, & the coating of additional materials (plural); such as metals or other polymers); col. 4, 23-col. 5, line 30+, esp. col. 4, lines 26-28

USSN: 10/723,321

Docket No. 56770US035

for vacuum system and moveable support, line 35 for continuous moving surface, lines 48-49 for smooth surface and sheet or flexible material substrate, lines 56-66 for metal or inorganic material deposited by evaporation or sputtering, line 68 for flash evaporation and col. 5, lines 20-30 for acrylate monomers; col. 6, lines 24-33+ for flash evaporation, etc., of monomers; col. 7, lines 5-15 for curing." (see the Office Action at page 4).

and that:

"The examiner notes in Yializis et al. ('893), lines 46-col. 8, line 2, as pointed out by applicants, that this reference notes that the deposition of inorganic material is optional (can be eliminated) or alternatively replaced by a second monomer deposition system, however optional or alternative teachings do not negate other teachings, and as noted above the monomer coating is taught as a top protective coating, as well as a base coating before other coatings & the process is taught to be related to capacitor formation which constitutes at least triple layer deposition, hence taken as a whole these teachings would have been suggestive to one of ordinary skill of depositing an acrylate layer followed by an inorganic layer, with a protective acrylate layer on top to serve the taught protective function thereof, in order to provide taught features and be consistent with the statement of scope (col. 4, lines 18-22), but especially in view of analogous teachings in the paper presented 4/30/1992 by Dr. Shaw, which note the technique has coating uniformity [thickness] of approximately 3%, specifically recommends producing barrier coatings for packaging applications and exemplify coating sequences of acrylate/metal with acrylate protective coating after metallization, noting any combination of metal and/or polymer coating steps are possible (page 854, especially 2nd & 3rd paragraphs in 1st col., and last three paragraphs in 2nd col.), which supplies explicit motivation for the desirability of the claimed configuration, as well as recognition of the barrier properties of the materials taught by both primary references." (see the Office Action at page 5).

Reconsideration is requested. The references should be read fairly, and not said to show features they do not contain. For example, Yializis et al. '893 do not disclose application of

USSN: 10/723,321

Docket No. 56770US035

an "inorganic or metal layer ... followed by another vapor deposited acrylate monomer layer, which is cross-linked", and do not disclose deposition of "Additional interleaved layers". Yializis et al. '893 say that their metal or inorganic material deposit system 106 may be **eliminated** or that **alternatively** it could be replaced "by a second liquid monomer delivery, metering and deposit system ... to deposit a second layer of the same or different monomer mixture on the substrate" (see e.g., col. 7, line 62 through col. 8, line 2, emphasis added). Doing so would deposit a monomer layer, or a monomer layer and an "inorganic/metal" layer, or two (same or different) monomer layers. However, Yializis et al. '893 nowhere disclose sequential deposition of a monomer layer, an inorganic layer, and a monomer layer.

Yializis et al. '893 do not say that "the monomer coating is taught as a top protective coating, as well as a base coating before other coatings" (emphasis added). Yializis et al. '893 do say at col. 1, lines 18-22 that "The resultant cured films are extremely thin—generally less than 4 microns thick—but function as protective coatings for the underlying substrate or as a base for a **subsequent coating**" (emphasis added). This is in line with the above-mentioned deposition of a monomer layer, or a monomer layer and an "inorganic/metal" layer, or two (same or different) monomer layers. It is not a disclosure of "subsequent coatings" or of triple layer deposition as averred in the Office Action.

Yializis et al. '893 say that their invention is related to several pending applications involving capacitors (see e.g. col. 1, lines 23-38). The referenced capacitor films have however hundreds or thousands of metal layers, are opaque, and would not provide a "transparent barrier film" as recited in the rejected claims.

Yializis et al. '893 refer to "coatings for packaging" (see e.g., col. 3, lines 32-35), but nowhere refer to "barrier coatings" or barrier properties. Not all packaging coatings are barrier coatings. Moreover, Yializis et al. '893 nowhere evidence any "recognition of the barrier properties of the materials taught by both primary references" as averred in the Office Action.

Dr. Shaw's cited 1992 article discusses metallized barrier coatings for packaging applications, but does not disclose barrier coatings with a layer of "transparent oxide oxygen barrier material" as recited in the rejected claims.

The Office Action also asserted that:

USSN: 10/723,321

Docket No. 56770US035

"In Shaw et al. (461), see the abstract; figures 2 & 4; col. 1, lines 15-18; col. 2, lines 14-12 (multilayer structures with multiple dielectric layers, or dielectric & interleaved metal or other inorganic material layers); Summary; esp. col. 3, lines 26-40+, col. 4, lines 7-9 & 23-31 (flexible substrates, such as plastics, i.e. polyester, polyethers, polyolefins or the like & use as coatings for packaging); col. 6, lines 23+ (acrylate monomers); col. 9, lines 1-31 (EB vaporization or sputtering of exemplary aluminum in multilayer structure with vaporized acrylate resins); col. 10, lines 10-52 (multiple monomer layers may be cured together, but deposited dielectric is cured before deposit of inorganic such as metal layers); col. 11, lines 26-50 (rotatable drum, inorganic or metal material deposited); col. 12, lines 50-64 (describes figure 2c, with first & second monomer flash evaporation deposition systems and inorganic deposition stations 1 & 2); col. 13, lines 1-10 and 51-61 (metal or other inorganic material by evaporation or sputtering onto cross-linked monomer); col. 14, lines 9-41, especially 39-41 (figures 14 showing layer structures with inorganic material interleaved between thicker dielectric layers, where the cured film is "water clear throughout the structure to provide a relatively transparent structure"); etc; and claims 3-5, 8-9, 15, 17-19, 22-24 & 36." (see the Office Action at pages 4-5).

and that:

"Note that Shaw et al. ('461) explicitly sets forth the dielectric acrylate/inorganic/dielectric acrylate... layer transparent structure, such that the Dr. Shaw 4/30/1992 article, while providing cumulative teachings is repetitious of those in the Shaw et al. patent, except explicitly discussing just the three layer structure and explicitly noting that the coatings for packaging are intended as barrier layers, thus showing the inherency of this feature and/or the desirable use & optimization therefore, as well as explicitly suggesting the top monomer layer be used as a protective layer." (see the Office Action at pages 5-6).

Reconsideration is requested. Shaw et al. '461 do not describe "layer structures with inorganic material interleaved between thicker dielectric layers, where the cured film is "water clear throughout the structure to provide a relatively transparent structure"" as averred in the Office Action. Also, Shaw et al. '461 do not "explicitly" set forth the "dielectric

USSN: 10/723,321

Docket No. 56770US035

acrylate/inorganic/dielectric acrylate... layer transparent structure" averred in the Office Action. Shaw et al. '461 do say at col. 14, lines 9-11 that "A variety of different size and shape multi layered structures formed by the process and apparatus disclosed herein are available". Shaw et al. '461 next discuss at col. 14, lines 11-38 the multi layer structures shown in their Fig. 14a through Fig. 14d. The Fig. 14a multi layer structure includes only deposited dielectric layers, and the remaining Fig. 14b through 14d multi layer structures include deposited dielectric and deposited inorganic layers. Shaw et al. '461 next say at col. 14, lines 39-41 that:

"A multilayer structure **has also been made** in which the cured film is water clear throughout the structure to provide a relatively transparent structure" (emphasis added).

By using the phrase "has also been made", Shaw et al. '461 indicate to a reader that the referenced water-clear multi layer structure is something other than the previously-described multi layer structures of Fig. 14a through Fig. 14d. Shaw et al. '461 nowhere say that this water-clear multilayer structure contained inorganic layers, let alone transparent oxide layers. Shaw et al. '461 were referring to a structure containing only deposited acrylate layers. Note in this regard that the immediately following text at col. 14, line 43 through col. 15, line 12 (viz., EXAMPLE I) describes the formation of a multiple layer article with 1,300 deposited acrylate layers and no intervening metal or inorganic layers, and that this multiple layer article is said to provide "good moisture resistance".

The Office Action also asserted that:

"Yializis et al. ('893) or Shaw et al ('461), both differ from the claims by not disclosing that their inorganic material deposited between layers of flash vapor deposited and cross-lined acrylate is a transparent oxygen oxide barrier film or that the acrylate layer is a smoothing layer. The primary patent references deposit the acrylate monomer in the same manner as taught by the present application, hence while the layer is not called a "smoothing" layer, it must inherently have the same effect when deposited on analogous plastic substrates, that may be thermoplastics as claimed, especially in view of the Dr. Shaw 4/30/1992 article, which indicates that the analogous process produces a uniformity of approximately 3% variation in thickness,

USSN: 10/723,321

Docket No. 56770US035

which would have been expected to be consistent with the claimed reduction of substrate surface roughness.” (see the Office Action at page 6).

Applicants agree that Yializis et al. '893 and Shaw et al. '461 do not disclose that a layer of “inorganic material deposited between layers of flash vapor deposited and cross-lined acrylate is a transparent oxygen oxide barrier film” or that “the acrylate layer is a smoothing layer”. Applicants do not agree with the Office Action’s averment that “The primary patent references deposit the acrylate monomer in the same manner as taught by the present application, hence while the layer is not called a “smoothing” layer, it must inherently have the same effect when deposited on analogous plastic substrates”. An insufficiently thick acrylate monomer layer would not “reduce the substrate surface roughness” as recited in claim 10. Applicants say for example at page 5, line 28 through page 6, line 3 that:

“It is desirable that the thickness of the acrylate layer be sufficient for smoothing surface roughness of the underlying substrate. For example, polypropylene may have a surface roughness in the order of 1/2 to one micrometer. A layer of acrylate about two micrometers thick is adequate for smoothing the surface sufficiently to avoid steep slopes that would not readily accept vacuum metallizing.”

The one micrometer thick initial acrylate layers employed in Shaw et al. '461’s working examples are less than this recommended amount. Yializis et al. '893 do not set out working examples, but do say that their condensed cured films are less than 4 microns thick, preferably are less than two microns thick, and may be 1 micron or even 0.1 microns thick (see e.g., col. 1, lines 18-22, col. 2, lines 30-34, col. 3, lines 18-19, col. 7, lines 13-16, claim 1 and claim 14). Whether or not any such films could provide a smoothing layer would depend on several factors including the chosen substrate. Yializis et al. '893 do not quantify substrate roughness, and do not say to apply sufficient acrylate monomer to reduce the substrate surface roughness.

Applicants also do not agree that Dr. Shaw’s cited article “would have been expected to be consistent with the claimed reduction of substrate surface roughness”. Dr. Shaw’s statement that “The uniformity is approximately 3%” was made in reference to an electron microscope picture (said to be Figure 2, but actually Figure 9, reproduced below) which

USSN: 10/723,321

Docket No. 56770US035

showed a cross-section of several deposited layers but was not said to show the substrate surface:

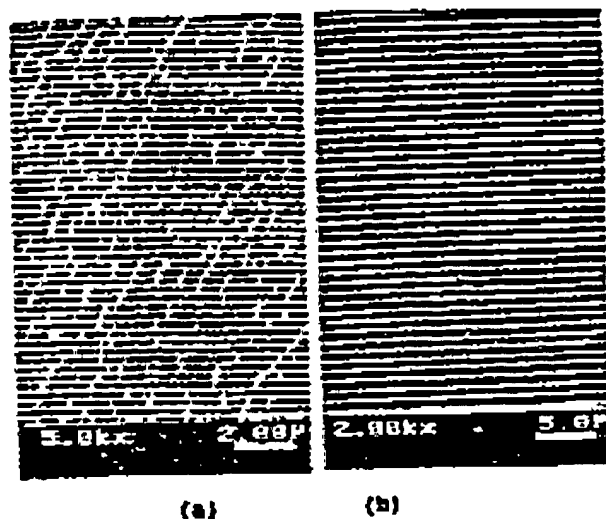


FIGURE 9: A) CROSS SECTION OF A 4.7 uF CAPACITOR WITH A 0.3 MICRON DIELECTRIC
B) CROSS SECTION OF A 0.47 uF CAPACITOR WITH A 1.0 MICRON DIELECTRIC

Fig. 9 may show that the deposited layers are uniform, but it does not teach that the first deposited layer will reduce the substrate surface roughness. If asked to consider the matter, a person having ordinary skill in the art would be more likely to conclude that the cited 3% layer uniformity would reproduce irregularities in the substrate irregularities, rather than reducing substrate surface roughness.

The Office Action also avers that:

"While barrier layers are not explicitly discussed, coatings for packaging materials and interleaved multilayers, such as substrate/acrylate/inorganic material/acrylate with possible repeated sequences are suggestive of barriers coatings, especially in view of the Dr. Shaw 4/30/1992 article discussed above, and of Komiya (EP) who teaches the known usefulness of inorganic compounds, such as Si oxide as transparent gas barrier material in packaging materials (page 2, lines 10-

USSN: 10/723.321

Docket No. 56770US035

25), and further teaches that such gas barriers may be improved by a polymeric overcoat (page. 3, Summary), explicitly stating that the combination has "superior gas barrier properties"), hence applicant's arguments that contradict this explicit teachings are not convincing. The examiner notes that one of ordinary skill would recognize that for the protective function of preventing the known prior art problem of cracking of thin-film inorganic or metal compound barrier layers (page 2), the surface resin layer would have been expected to improve the overall barrier properties of the composite structure, since cracks would interfere with the performance of barrier functions, thus providing further suggestion that inorganic barrier layers should have a top protective coating to protect against this known problem. Komiya (EP) provides specific examples of plastic substrates (polyester, polypropylene, PET, etc., page 3, lines 36-41), and of oxides or nitrides, etc., such as Si_xO_y , Al_2O_3 , Si_3N_4 , where those that are transparent are particularly preferred, and deposition processes include sputtering, CVD, plasma deposition, etc. Therefore, it would have been obvious to one of ordinary skill in the art, given Komiya's teachings of the usefulness of those inorganic materials as barrier materials and their deposition techniques in preparing packaging materials, to employ them in the process of Yializis et al. ('893) or Shaw et al. ('461), for their taught use in coating packaging substrates and generic inorganic interleaved layer, for their known gas barrier properties, and expected effectiveness, especially given overlapping deposition techniques for specific desirable species of the primary references generic teachings. Komiya (EP) also provides cumulative reasons for specifically using a top protective monomer coating when coating packaging materials, as it shows the problems known when not using a protective coating, but the primary references suggest either top protective acrylate coatings or final acrylate monomer coatings in a series of interleaved layers." (see the Office Action at pages 6-7).

Reconsideration is requested. Applicants agree that the cited primary references do not discuss barrier layers. Applicants rely on their above-mentioned arguments concerning Dr. Shaw's 1992 article. As recommended by the Examiner during the above-mentioned interview, applicants have amended claim 10 to provide further basis for their argument that

USSN: 10/723,321Docket No. 56770US035

Komiya EP is not properly combinable with Yializis et al. '893, Shaw et al. '461 or Dr. Shaw's 1992 article. Claim 10 now recites that the protective layer is applied to the oxygen barrier material "by chilling the thermoplastic substrate and condensing and crosslinking an acrylate monomer composition on the oxygen barrier material". Komiya EP cautions that transparent thin-film layers of an inorganic or metal compound are prone to fine crack formation, and presumes that such cracks result from expansion and contraction when the substrate is heated and the thin film layer can not follow such expansion and contraction (see e.g., page 2, lines 26-32). If asked to consider the matter, a person having ordinary skill in the art would conclude that a layer of transparent oxide oxygen barrier material should not be formed using the Yializis et al. '893 or Shaw et al. '461 apparatus (which each employ a water cooled drum 35) or in applicants' claim 10 method (which employs a step that includes chilling the substrate), because Komiya EP's statements imply that not only heating but also chilling the substrate could cause the thin-film crack formation that Komiya EP warns against.

If asked to consider the matter, a person having ordinary skill in the art would also conclude that if Komiya EP's heat buffer layer were interposed between a chilled substrate and a flash-evaporated acrylate monomer protective layer, the heat buffer layer would discourage or prevent condensation from occurring and would be counterproductive in the Yializis et al. '893 or Shaw et al. '461 apparatus or in applicant's claim 10 method. If a "proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification", see MPEP §2143.01.

Applicants disagree with the Office Action's assertion that "Komiya (EP) also provides cumulative reasons for specifically using a top protective monomer coating when coating packaging materials, as it shows the problems known when not using a protective coating". Komiya EP does not apply a "monomer". Komiya et al. applies its heat buffer layer by dry laminating a finished film to the thin-film oxide layer (see e.g., page 4, lines 13-17 and page 5, lines 20-22).

Komiya EP is not properly combinable with Yializis et al. '893, Shaw et al. '461 or Dr. Shaw's 1992 article. Applicants accordingly request withdrawal of the 35 U.S.C. §103(a)

USSN: 10/723,321

Docket No. 56770US035

rejection of claims 10-19 and 21 as being unpatentable over Yializis et al. '893 or Shaw et al. '461 in view of Komiya EP and optionally further considering Dr. Shaw's 1992 article.

Rejection of Claim 20 under 35 U.S.C. §103

Claim 20 was rejected under 35 U.S.C. §103(a) as being unpatentable over Yializis '893 or Shaw et al. '461 in view of Komiya EP, optionally further considering Dr. Shaw's 1992 article as applied to claims 10-19 and 21 above, and further in view of U.S. Patent No. 4,096,315 (Kubacki) or Japanese Patent No. 4-353819 (Kadowaki), on grounds that:

"The main difference between this amended claim & the above combination of section 6, is the use of a plasma to treat the acrylate smoothing layer deposited on the substrate in vacuum before deposition of transparent oxygen barrier layer thereon, however both primary references teach the necessity of curing their vapor deposited monomer before subsequent inorganic material deposition, although their suggested treating techniques are electron beam or ultraviolet radiation (Yializis et al.-col. 1, lines 12-22+; Shaw et al.-col. 3, lines 61-65 & -col. 7, lines 58-61), but as would have been recognized by one of ordinary skill, plasmas supply both energetic electrons and generally UV radiation also, thus would have been consistent with the primary references' required curing as plasma apparatus emit appropriate curing means. Note that the sequence of claims 10+20 do not actually require any cure to have occurred, thus do not exclude the plasma treatment from being a curing step.

"However, plasma pretreatment before subsequent coatings for improved adhesion effects is also old and well known in the art as shown by Kubacki (abstract; col. 2, lines 10-52, especially lines 15-1725-35 & 46-50) who teaches a process of coating in acrylate containing substrate (PPMA) where the first step is a preliminary plasma treatment to form hydroxyl groups via plasma to effect good adherence of the sequentially applied coating that contains SiO₂, or Kadowaki whose abstract teaches a molded polymerized substrate containing methacrylate components, which is subject to plasma treatment followed by a coating containing silanol groups, silica and metal complex components, therefore it would have been obvious to one of ordinary skill in the art to perform plasma treatments to acrylate surfaces of the primary references in

USSN: 10/723,321

Docket No. 56770US035

order to enhance adhesion of successive oxide coatings, as good adhesion is desirable in any product which is not meant to deteriorate, especially where the barrier properties are desired to be effective and permanent." (see the Office Action at pages 7-8).

Reconsideration is requested. Applicants rely on their above-mentioned arguments concerning claim 10 to show why claim 20 is not obvious over the cited references. As recommended by the Examiner during the above-mentioned interview, applicants have also amended claim 20 to provide further basis for their arguments. Claim 20 now recites that "the smoothing layer is cured" and "treating the cured smoothing layer with a reactive plasma before applying the transparent oxide oxygen barrier material". The recited reactive plasma treatment is not needed to cure the smoothing layer (since as recited in claim 20 it is already cured), and the recited plasma treatment employs a reactive plasma and not merely any plasma treatment.

Applicants accordingly request withdrawal of the 35 U.S.C. §103(a) rejection of claim 20 as being unpatentable over Yializis or Shaw in view of Komiya, optionally further considering the article by Dr. Shaw and further in view of Kubacki or Kadowaki.

Double Patenting Rejections

Claims 10-11, 13-16 and 21 were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-9 of copending Application No. 11/272,929. Similar double patenting rejections were made against claims 12 and 17-19 and against claim 20 over claims 1-9 of copending Application No. 11/272,929. The present application has an effective filing date approximately 10 years prior to the April 2, 2003 effective filing date of the '929 application. Applicants do not agree with the double patenting rejection or the asserted reasons, but understand that the appropriate procedure would be to withdraw the provisional double patenting rejections and permit the present application to issue as a patent, see MPEP §804. Applicants accordingly request withdrawal of each of the double patenting rejections.

USSN: 10/723,321

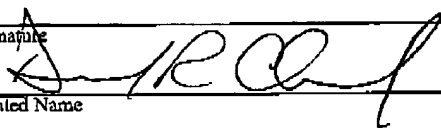
Docket No. 56770US035

Conclusion

Applicants have made an earnest effort to address all the rejections, and their withdrawal and the allowance of all claims are requested. The Examiner is also requested to call the undersigned attorney if there are any questions regarding the application or this amendment.

Respectfully submitted on behalf of
3M Innovative Properties Company,

| | |
|---------------------|-------------------|
| Registration Number | Telephone Number: |
| 29,524 | 612-331-7412 |
| Date | |
| August 25, 2006 | |

| |
|--|
| Signature |
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| Printed Name |
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